

Managing the Red Zone

The human body is naturally oriented toward expending energy during daylight hours and resting (restoring energy) during nighttime hours. The amount of energy available over a 24-hour period, therefore, normally peaks in daylight and bottoms out in darkness. Because performance tends to correlate with available energy, the human body tends to function most efficiently in daylight, when the energy level is highest, and least efficiently in darkness, when the energy level is lowest.

In this guide, the daily period of lowest energy and performance is referred to as the **Red Zone**. See Figure 1.

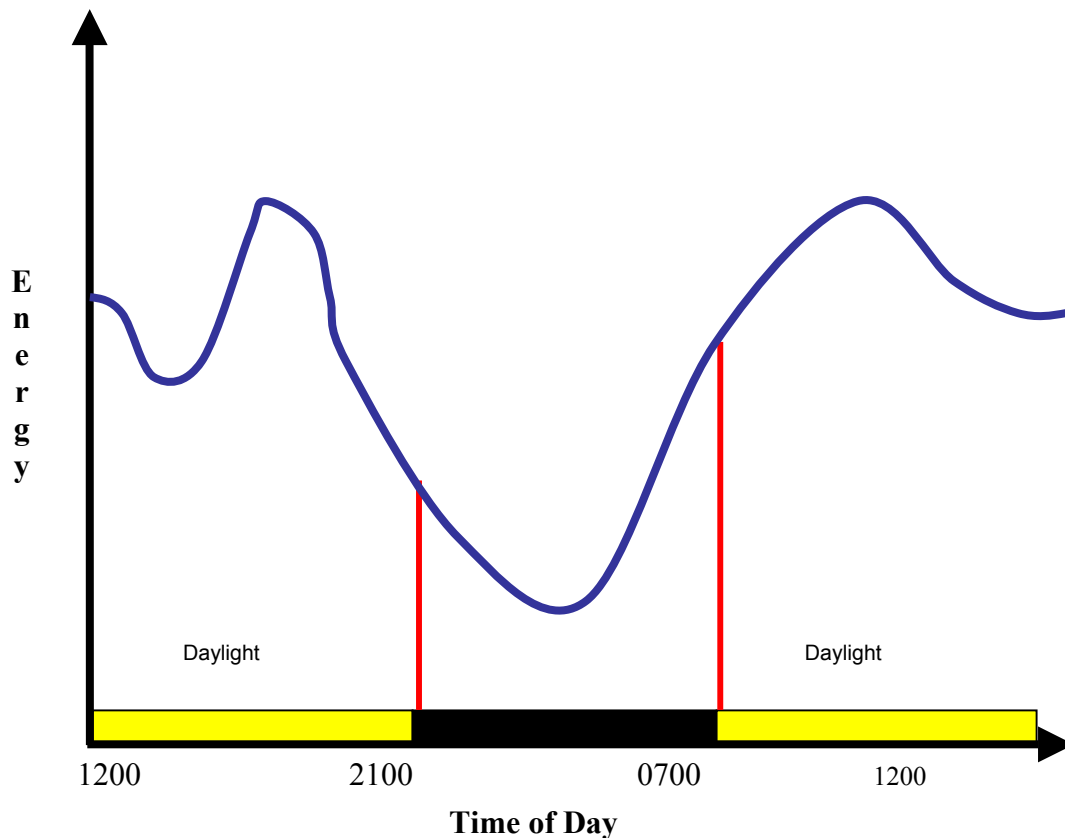


Figure 1. The **Red Zone** of energy and performance

The **Red Zone** is defined as the daily period when energy and alertness are at their lowest levels, typically spanning from bedtime to sunrise, **with the most-critical period spanning from 0300 to sunrise**. In the case illustrated in Figure 1, the full Red Zone spans from 2100 until 0700ⁱ.



Several factors can influence the duration as well as the intensity of individual Red Zones, including crewmember sleep, social, and dietary habits; the current period of sustained wakefulness; and accumulated sleep debt.

Although nighttime is usually considered a period of increased operational risk, proven light-management techniques can be used to cause crewmember energy and alertness levels to peak during nighttime hours instead of during daylight hours. In other words, the Red Zone of individual crewmembers can be shifted, as needed, to accommodate 24-by-7 watch and workload schedules. See Figure 2.

Figure 2 shows the Red Zone being shifted into full daylight hours to accommodate sleeping during the day versus at night. The three bars/arrows indicate the amount of relative shift realized by applying light-management techniques (discussed in Section III) over three different periods of time. (**Note:** If sunrise occurs prior to 0700, daylight may be used for light management once it is of sufficient intensity.)

CAUTION! Light Management involves being exposed to measured amounts of ambient light of a specific intensity and wavelength (color). Light Management does not involve staring into naked light bulbs.

ⁱ Red Zone time frames tend to vary with the chronotype of the individual, with some individuals being prone to sleep late into morning hours; others, to wake up with the birds.